

AMENDMENTS TO THE SPECIFICATION

Kindly amend the specification as follows:

[0001] In the mounting of an integrated circuit package to a printed circuit board, or similar support substrate, there are different methods of providing electrical interconnections between the package input/output (I/O) pads and the substrate pads. Different types of connecting devices can be used, according to the interconnection method and the configuration of the package.

[0032] Connector 10 comprises a first contact surface shown as flat pad (12), a flexible portion comprising two parallel flexible arms (14, 16), and a single spring tip or second contact surface (18). The surface portion of pad (12) provides an appropriate surface for soldering the connecting device onto an IC package I/O pad. Spring arms (14, 16) are compressed or flexed when the IC package is pressed down onto the printed circuit board. Spring arms exhibit elastic compliance or resilience and maintain contact force in order to provide appropriate contact of tip (18) with a pad on a printed circuit board. The tip (18) directly contacts a pad of a printed circuit board or substrate, without any use of bonding material.

[0033] The shape of connector (10) ensures reliable contact between contact pads on an IC package and printed circuit board (PCB). As shown in Figure 2, the connecting device arms (14, 16) have a flat shape, positioned at an angle of approximately 45 degrees from the horizontal, which allows mechanical strain to be evenly distributed along the length of the spring arms which the connector is pressed as described, and thereby avoiding stress concentration zones that would exceed the elastic limit of the material of connector (10). Connector (10) also may include a tab portion (19) in addition to pad (12), which

provides additional mechanical support of the solder joint between the connector (10) and the IC package.

[0035] Connector device (10) may be made of a material with suitable spring properties, for example Beryllium-copper, which is a well-known spring connector material used in the electronic industry. Beryllium-copper has a high elastic limit, that allows important elastic deformation when pressing forces are applied before any permanent deformation is induced into the material. Reliable electrical contact is obtained by use of appropriate surface finishes, for example, gold plating on the connector tips (18), and contact surfaces of pad (12) printed circuit board pads. One preferred way of fabricating the connecting device (10) is to stamp the appropriately shaped connectors from a flat metal sheet, and then fold the connectors into an appropriate form as may be shown in Figure 2.

[0036] Figure 3 shows a connecting device known from the prior art. In comparison, the inventive connector (10) of Figure 2, may have similar length and thickness. The total width of the two parallel arms of the connector (10) of Figure 2 may be similar to the width of the single arm of the prior art connecting device. Consequently, these two devices have similar flexibility; consequently the force that is required to flex these connecting devices is similar.

[0037] One advantage of the inventive connector (10) of Figure 2 over the prior art device of Figure 3 is the reduced inductance obtained by separating the flexible arm into two parallel conductors.

[0040] As a result, it has been determined that reduced inductance of connector (10) of Figure 2 has a self-inductance of 480 pico-henry, compared to 580 pico-henry for the prior art device of Figure 3. In a typical design, distance "s" between the centers of the two parallel arms (14) and (16) of connector of

Figure 2 is approximately .015 inches, and the length of the parallel arms (16, 14) is .045 inches.

[0041] It is apparent that the above description and formula that increasing the number of conductors in the flexible portion of the connector (10) to more than 2 would result in a connector of even further reduced inductance.

[0043] Figure 5 shows a side view of an IC package (24) assembled on an appropriate substrate (30), for example, a printed circuit board. IC package (24), with connectors (10) pre-attached to I/O pads (25), is assembled onto printed circuit board (30) with connecting devices (10) in compression or flexed. Each connector (10) will be compressed or flexed onto an individual printed circuit board pad (31), and thus provide electrical connection from the IC package (24) to the printed circuit board (30) when IC package (24) and circuit board (30) are pressed together. Appropriate hardware mechanism may be used to apply suitable compression force to the package (24) in order to flex the connectors (10). Such compression hardware may include retaining screws (35), top plate (36), and bottom plate (37). During compression assembly, retaining screws (35) are fastened into the bottom plate (37), creating compressive force on the array of connector (10) as previously described. Such hardware mechanisms are known.

[0047] Illustrated connector (40) comprises a flat pad or contact surface (41), a flexible portion comprised of two parallel flexible arms (43, 45), and a second flat pad or contact surface (47). The second contact surface (47) provides an appropriate surface for soldering the connector (40) onto an IC package I/O pad. Flexible portion consisting of arms (43, 45) are connected to the flat surfaces (41) and (47) by means a U-shape bend in the material of connecting device (40). Appropriate choice of material makes the two parallel

flexible arms to be compliant to absorb deformations resulting from thermal expansion differential between the interconnected IC package and printed circuit board. As noted from the previous description, the two parallel flexible conductors (43) and (45) could be replaced with a plurality of parallel conductors, each of similar shape and size.

[0048] One preferred way of fabricating the connector (40) is to stamp the appropriate shape from a flat metal sheet, and then fold it into an appropriate form as is shown in Figure 7. Appropriate surface finishes can be applied to the connecting elements (41) and (47) using standard plating or inlay cladding methods. Connectors (40) may be more of beryllium-copper based metal, as described for the previous connector embodiment with a coating of tin or other suitable metal to assure solderability.

[0051] Figure 10 shows an alternative shape and design of a connector to be used with the preferred embodiment of the invention previously described and shown with respect in Figures 6 to 9 similar as the previously described connector (40). This connector (70) comprises a flat pad (71) or contact surface, a flexible portion comprised of two parallel flexible arms (73, 75), and a second flat pad (77) or contact surface. Only two parallel conductor arms illustrated but connector (70) could have more than two arms as is apparent. Second flat pad or contact surface (77) provides an appropriate surface for soldering the connector (70) onto an IC package I/O pad. As can be seen from Figure 10, both top and bottom flat pad contact surfaces (71, 77) comprise a semi-circular portion and a tab portion, obtained by cutting and bending the appropriate shape from a flat metal sheet, and then folding it into an appropriate form to thereby provide for greater surface area for soldering resulting in solder connections of greater strength.
